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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone-enhanced layers in the troposphere over the equatorial Pacific Ocean and the influence of transport of midlatitude UT/LS air" *by* H. Hayashi et al.

Anonymous Referee #1

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General Comments

This manuscript presents analysis of the occurrence of ozone-enhanced layers in ozonesonde data at three southern tropical stations. The number of layers is quantified, and these layers are attributed to biomass burning or transport of air from midlatitude UT/LS. This is an interesting analysis, and worthy of publication in ACP. However, I think revisions are required before the manuscript can be accepted. In particular, as outlined below, several aspects of the analysis appear to be based on visual comparison of maps, and need to be replaced by some quantitative analysis.

Specific Comments

1. A key result of this paper is the characterization of the o3-enhanced layers into those caused by biomass burning and those by transport from mid-latitudes. However, the actual criteria used to define the layers into these 2 causes is not clearly defined, and there is no discussion of the sensitivity to choices made in this criteria.

It is stated that categorized as from biomass burning from evidence of backward trajectories, hot spot maps and OLR values. This give the impression that this is done visually (i.e. subjectively). If this is the case this is not good enough. If it is done objectively the criteria used (i.e. what values on hot spot and OLR maps are used to identify biomass burning, and how close do the trajectories have to get), and sensitivity to choice of parameters needs to be discussed.

Similarly, an objective measure is needed to define layers that come from transport from mid-latitudes UT/LS, and this needs to clearly described.

2. Figure 8 shows that the cause of a significant amount of the events, especially for Watukosek and San Cristobal, cannot be identified. More discussion of this is required. Is there a third cause of layers or is this an issue with the criteria used for above types of events? These "not identified" events need to be examined in more detail. What are the flow characteristics when these events occur? Can you at least show some examples?

3. The discussion/analysis in section 4.3 is not that convincing. All that is shown is a few examples. How are we to know these examples are typical? Can't trajectories for multiple cases of the same type of events be shown on the same plot? It would actually be even better if some type of cluster analysis was done to show the different types of events.

Minor Comments

pg 17185, line 20- This paragraph is a confusing. First it is started that 90% of o3-enhanced layers have lower RH, but then latter it is stated that 40% of cases at

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Watukosek has higher RH. These statements appear contradictory. These sentences need to be reworded so clearer.

pg 17186. Why is section 4 called Discussion when it is still presenting results?

Figs 5 to 7 should be on same latitude-longitude scale, and these 3 figures could be combined into a single figure. Quantities shown in figs 6 and 7 could even be on same plot.

Similarly for figs 11 to 13.

pg 17194: Why reference Palmen and Newman 1969 here and not some of the more relevant papers mentioned in the Introduction.

Same page: It is not true that previous studies have shown PV only reaching around 20 degrees and not to the equatorial region. For example, the events in Waugh and Polvani were defined as high PV at 10 degrees, so in all their events high PV gets to at least 10 degrees. Also examples shown in several papers show high PV at lower latitudes.

In the conclusions it is stated that differences in meteorological conditions cause differences in seasonal differences in occurrence of enhanced layers at Watukosek and San Cristbal, but no details are given. How does the meteorology change, and why does this cause a difference? This is buried in 4.3, but needs to be more clearly stated in the conclusions.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17179, 2007.